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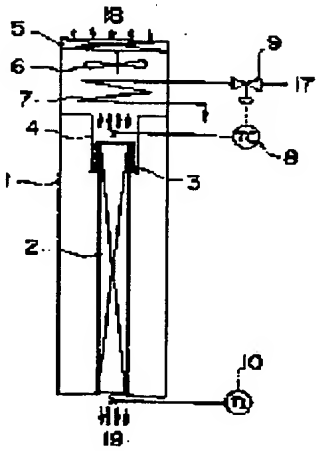
(54) METHOD FOR DRYING HOLLOW FIBER BUNDLE

(57)Abstract:
PURPOSE: To accomplish the subject drying through quick evaporation of the water or another washing solvent left inside hollow fibers by forcedly ventilating a drying gas through the inside of the hollow fibers.
CONSTITUTION: A ventilating cylinder 4 is fitted with a hollow fiber bundle 2 wet with a washing solvent therefor, and a suction air 18 taken via a filter 5 is heated to a specified temperature using a heater 7 and then fed to the inside of the hollow fiber bundle; thereby, the water, etc., left in the fiber bundle is evaporated by the suction air passing through the inside of the hollow fibers.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The desiccation approach of the hollow fiber bundle which carries out aeration of the gas for desiccation to the interior of a hollow fiber compulsorily.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the solvent in the time of manufacture of a hollow fiber bundle etc. included in a hollow filament, and the method of performing efficiently desiccation processing which evaporates moisture for a short time.
[0002]
[Description of the Prior Art] The membrane separation device incorporating filtration film, such as ultrafiltration membrane and a reverse osmotic membrane, is used for fields, such as waste water treatment, manufacture of pure water, freshening of seawater, and an artificial kidney and plasma separation, and the hollow fiber is widely applied as such filtration film. In the process which manufactures this hollow fiber, when manufacturing a hollow fiber by the wet spinning method, washing processing of the hollow fiber by water etc. is indispensable because of deliquoring. By the way, after carrying out washing processing of this hollow fiber, in the process which assembles a hollow fiber bundle as a membrane separation device, it is necessary to dry the washing solvent of water and others.
[0003] In order to require long duration and to carry out high production of the hollow fiber bundle until desiccation processing of such a hollow fiber bundle is conventionally performed by putting a hollow fiber bundle into the thermostat which only circulates through heating air and the interior of a fiber bundle gets dry completely, there was a fault for which a very large-sized thermostat is needed.
[0004]
[Problem(s) to be Solved by the Invention] In order to produce a hollow fiber so much, the desiccation approach of evaporating the washing solvent of water and others from a hollow fiber bundle efficiently for a short time is industrially important. However, since the approach or equipment which dries a hollow fiber bundle for a short time is not known conventionally, the purpose of this invention is to offer the approach of drying a hollow fiber bundle efficiently for a short time.
[0005]
[Means for Solving the Problem] This invention is the desiccation approach of the hollow fiber bundle by the forcible aeration in a hollow fiber. In this invention, from the end of the bundle of the hollow fiber in which the interior got wet with the liquid, if it is below 600mmH2 O about the gas for desiccation which heated the gas for desiccation preferably according to extent of pressure loss, when exceeding this using a centrifugal fan or an axial flow fan, the interior of a hollow fiber is compulsorily passed using a rotary blower etc., and evaporation desiccation of the liquid contained inside a hollow fiber is carried out.
[0006] this invention -- setting -- a hollow fiber bundle -- abbreviation -- the bundle of the fiber of the shape of hollow cut to an even length by fixed die length is said, for example, although the bundle of the hollow fiber filtration film by synthetic macromolecules, such as the poly acrylic nitril and polysulfone, and the playback macromolecule of a cellulose system is typical, the die length of the quality of the material, the configuration of a fiber number or a fiber cross section, a dimension, thickness, or a fiber bundle and especially the configuration of

a fiber bundle are not limited. For example, the bore of a hollow fiber has the period 0.5-5mm [which is used for ultrafiltration membrane from about 100-micrometer thing used for an artificial kidney] until a thing. Furthermore, the class of gas for desiccation, temperature, the aeration rate in a hollow fiber, especially the class of solvent to evaporate, etc. are not limited. Said aeration rate has a good second in 0.5m /or more. Although the desirable range changes with fiber configurations etc., it is 0.5-10m/second, for example.

[0007]

[Example] Hereafter, based on the illustrated example, this invention is explained concretely.

[0008]

[Example 1] Drawing 1 is the schematic diagram of the example which applied this invention to desiccation of a hollow fiber bundle. In drawing 1 , the vent sleeve (4) prepared in the body of a dryer (1) is equipped with the hollow fiber bundle (2) which got wet with the liquid. A sealing agent (3) is twisted around a hollow fiber bundle (2), and it is made not to produce a clearance between a hollow fiber bundle (2) and a vent sleeve (4) at this time. The air (18) which carried out inhalation of air through the filter (5) with the centrifugal fan for inhalation of air (6) is heated to predetermined temperature at a heater (7), is compulsorily supplied to the interior of a hollow fiber bundle from the upper limit section of an empty fiber bundle (2) through cylinders (4), such as aeration, passes a hollow fiber, and exhausts it out of a system from the lower limit section. (8) is temperature detection equipment of a supply air, and (9) is the control-of-flow bulb of steam (17). Although the exhausted air evaporates the moisture contained in a hollow fiber bundle (2) and temperature falls with the latent heat, the temperature of the air (19) exhausted as desiccation is completed rises, and if desiccation is completed, it will reach the same temperature mostly with supply air temperature. (10) is detection equipment of this exhaust-gas temperature, and it is the monitor of the completion of desiccation.

[0009] Moreover, the amount of hot blast supplied from a vent sleeve (4) is fully abundant, and since it is [the direction] thermally more advantageous not to exhaust all, but to circulate through and reheat discharge air besides a system, and to use as a supply air, when the air temperature discharged from the edge of a hollow fiber bundle is high, it can design according to a situation. However, in order to carry out circulation use of the supply air in this case, humidity increases, and the rate of drying of a hollow fiber bundle becomes slow.

[0010]

[Example 2] Drawing 2 is the approach of adding heating and circulating through the air inside the body of a dryer to the approach of drawing 1 , and accelerating a rate of drying. That is, as for a heater for a circulation fan for (11) to circulate the air within the body of a dryer and (12) to heat a recirculating air (20), and (13), in drawing 2 , the detection equipment of circulation air temperature and (14) are the control-of-flow bulbs of steam. Moreover, (15) and (16) are ** of a recirculating air, and an exhaust air damper, respectively.

[0011] In addition, the amount of supply of the heated air, temperature, and humidity can be rationally determined if needed from the class of hollow fiber, die length, a fiber number, the necessary drying time, etc.

[0012]

[An example 3, the example 1 of a comparison] It carried out by the approach which showed desiccation processing of the moisture of the hollow fiber bundle created using polysulfone synthetic macromolecule by drawing 1 of the above-mentioned example. Spinning of the polysulfone undiluted solution which dissolved in 100wt%DMAC was carried out underwater, and it considered as the hollow fiber (bore phi0.7mm and outer-diameter phi1.3mm). Furthermore, after it cuts this hollow fiber to an even length in die length of 1.3m and 2025 converge, it is immersed into the glycerol water solution of 30% of concentration, and a glycerol water solution is made to permeate in a hollow fiber bundle enough.

[0013] The water content of the water contained in a hollow fiber bundle at this time was 98%. Water content is defined by 100x water weight/(polysulfone weight + glycerol weight). Drawing 3 is the result of comparing aging of the water content within a hollow fiber bundle until desiccation with the case where it is based on the case where it dries by the approach of this

invention, and the desiccation approach only put into the conventional thermostat is completed, when carrying out evaporation desiccation of the moisture from the hollow fiber bundle containing this water and glycerol.

[0014] That is, the desiccation processing by this invention carries out 0.3m3 / part (0.8m/second in average aeration rate in single yarn) supply of the air heated to 90-degree Centigrade into a hollow fiber bundle from the single-sided edge of a hollow fiber bundle, and the air containing the entrained moisture which comes out from the edge of the opposite side of a hollow fiber bundle is made to discharge out of a system, and is performed. On the other hand, desiccation processing put into the conventional thermostat of the example 1 of a comparison was performed by circulating the air which installed in the thermostat the shelf manufactured with the perforated plate, put the hollow fiber bundle every width on it, and was heated to 90-degree Centigrade. Although 45 hours is required for completing desiccation by this conventional desiccation approach, desiccation can be completed by the desiccation approach by this invention in 4 hours.

[0015]

[Effect of the Invention] By the desiccation approach of this invention, desiccation can become possible in a short time, and desiccation processing of a lot of fiber bundles can be performed efficiently.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the schematic diagram having shown the example of the desiccation approach of the hollow fiber bundle by this invention.
[Drawing 2] It is the schematic diagram having shown the example of the desiccation approach of the hollow fiber bundle by this invention.
[Drawing 3] It is the result of comparing aging of the water content within the hollow fiber bundle by the desiccation approach of this invention and the conventional technique.
[Description of Notations]
1 Body of Dryer
2 Bundle of Hollow Fiber
3 Sealing Agent
4 Ventilator
5 Air Filter
6 Inhalation-of-Air Fan
7 Heater
8 Temperature Detection Equipment
9 Steam Control-of-Flow Bulb
10 Exhaust-gas-Temperature Detection Equipment (Desiccation Termination Monitor)
11 Circulation Fan
12 Heater
13 Temperature Detection Equipment
14 Steam Control-of-Flow Bulb
15 Recirculating-Air Air-Supply Damper
16 Recirculating-Air Exhaust Air Damper

[Translation done.]

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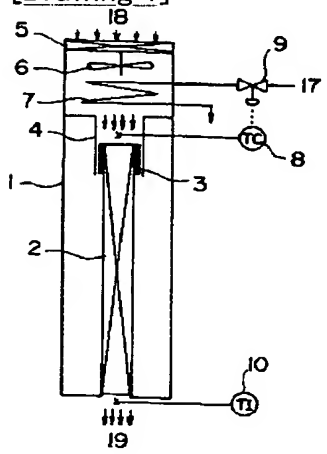
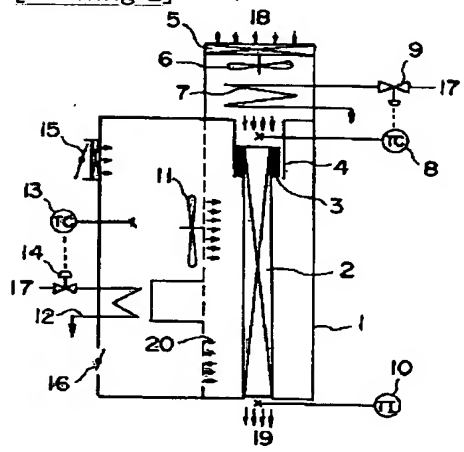
DRAWINGS

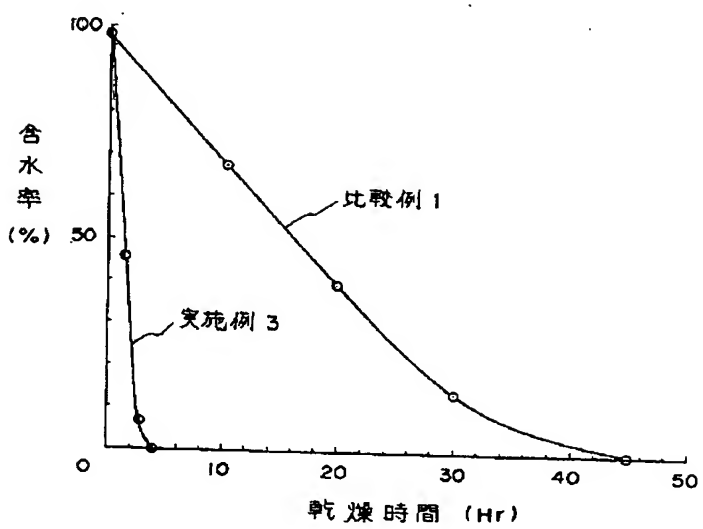
[Drawing 1]



[Drawing 2]



[Drawing 3]



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CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
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[Procedure revision]
[Filing Date] January 27, Heisei 11
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] The desiccation approach of the hollow fiber bundle which carries out aeration of the gas for desiccation compulsorily inside a hollow fiber from the single-sided edge of the bundle of the hollow fiber cut to an even length.
[Claim 2] The dryer of the hollow fiber bundle which has the vent sleeve which leads the gas for desiccation to the hollow fiber bundle end section, the fan who sends the gas for desiccation to a vent sleeve, and temperature detection equipment of the gas exhausted from the other end of the supply temperature detection equipment of the gas for desiccation, and a hollow fiber bundle.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0001

[Method of Amendment] Modification
[Proposed Amendment]
[0001]
[Industrial Application] This invention relates to the solvent in the time of manufacture of a hollow fiber bundle etc. included in a hollow filament, the method of performing efficiently desiccation processing which evaporates moisture for a short time, and the dryer used for it.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0004
[Method of Amendment] Modification
[Proposed Amendment]
[0004]
[Problem(s) to be Solved by the Invention] In order to produce a hollow fiber so much, the desiccation approach of evaporating the washing solvent of water and others from a hollow fiber bundle efficiently for a short time is industrially important. However, since the approach or equipment which dries a hollow fiber bundle for a short time is not known conventionally, the purpose of this invention is to offer the approach of drying a hollow fiber bundle efficiently for a short time, and equipment.
[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0005
[Method of Amendment] Modification
[Proposed Amendment]
[0005]
[Means for Solving the Problem] This invention relates to the desiccation approach of a hollow fiber bundle and equipment by the forcible aeration in a hollow fiber. (1) This invention Namely, the vent sleeve which leads the gas for desiccation to the desiccation approach of the hollow fiber bundle which carries out aeration of the gas for desiccation compulsorily inside a hollow fiber, and (2) hollow-fiber bundle end section from the single-sided edge of the bundle of the hollow fiber cut to an even length, It is related with the dryer of the hollow fiber bundle which has the fan who sends the gas for desiccation to a vent sleeve, and temperature detection equipment of the gas exhausted from the other end of the supply temperature detection equipment of the gas for desiccation, and a hollow fiber bundle. In this invention, from the end of the bundle of the hollow fiber in which the interior got wet with the liquid, if it is below 600mmH2 O about the gas for desiccation which heated the gas for desiccation preferably according to extent of pressure loss, when exceeding this using a centrifugal fan or an axial flow fan, the interior of a hollow fiber is compulsorily passed using a rotary blower etc., and evaporation desiccation of the liquid contained inside a hollow fiber is carried out.
[Procedure amendment 5]
[Document to be Amended] Specification
[Item(s) to be Amended] 0008
[Method of Amendment] Modification
[Proposed Amendment]
[0008]
[Example 1] Drawing 1 is the schematic diagram of the example which applied this invention to desiccation of a hollow fiber bundle. In drawing 1, the vent sleeve (4) prepared in the body of a dryer (1) is equipped with the hollow fiber bundle (2) which got wet with the liquid. A sealing agent (3) is twisted around a hollow fiber bundle (2), and it is made not to produce a clearance between a hollow fiber bundle (2) and a vent sleeve (4) at this time. The air (18) which carried out inhalation of air through the filter (5) with the centrifugal fan for inhalation of air (6) is heated to predetermined temperature at a heater (7), is compulsorily supplied to the interior of a hollow fiber bundle from the upper limit section of a hollow fiber bundle (2) through a vent sleeve (4), passes a hollow fiber, and exhausts it out of a system from the lower limit section. (8) is temperature detection equipment of a supply air, and (9) is the control-of-flow bulb of

steam (17). Although the exhausted air evaporates the moisture contained in a hollow fiber bundle (2) and temperature falls with the latent heat, the temperature of the air (19) exhausted as desiccation is completed rises, and if desiccation is completed, it will reach the same temperature mostly with supply air temperature. (10) is detection equipment of this exhaust-gas temperature, and it is the monitor of the completion of desiccation.

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	69/08		8822－4Ｄ		
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審査請求　未請求　請求項の数１(全　4　頁)

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(54)【発明の名称】　中空繊維束の乾燥方法

(57)【要約】
【構成】　洗浄液で濡れた中空繊維束の一端から加熱した乾燥ガスを供給して強制的に中空繊維内部を通過させる中空繊維束の乾燥方法。
【効果】　上記方法により、短時間で乾燥が可能となり、多量の繊維束の乾燥処理を効率良く行う事ができる。

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【特許請求の範囲】

【請求項１】　乾燥用ガスを強制的に中空繊維内部に通気する、中空繊維束の乾燥方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は中空繊維束の製造時などにおける、中空糸内に含む溶剤や、水分を蒸発させる乾燥処理を、短時間で効率よく行う方法に関するものである。

【０００２】

【従来の技術】排水処理、純水の製造、海水の淡水化や、人工腎臓および血しょう分離といった分野に、限外ろ過膜、逆浸透膜などろ過膜を組み込んだ膜分離装置が用いられており、この様なろ過膜として中空繊維が広く適用されている。この中空繊維を製造するプロセスなどにおいて、中空繊維を湿式紡糸法で製造する場合などは脱溶媒のため、水等による中空繊維の洗浄処理が必須である。ところで、この中空繊維を洗浄処理した後、中空繊維束を膜分離装置として組み立てる工程において、水その他の洗浄溶剤を乾燥させる必要がある。

【０００３】従来、この様な中空繊維束の乾燥処理は単に加熱空気を循環する恒温槽内に中空繊維束を静置することにより行われており、繊維束内部が完全に乾くまで長時間を要し、中空繊維束を多量生産する為にはきわめて大型の恒温槽が必要となる欠点が有った。

【０００４】

【発明が解決しようとする課題】多量に中空繊維を生産する為には、短時間で効率良く中空繊維束から水その他の洗浄溶剤を蒸発させる乾燥方法が工業的に重要である。しかし従来、中空繊維束を短時間で乾燥させる方法または装置が知られていない事から、本発明の目的は中空繊維束を短時間で効率良く乾燥する方法を提供する事にある。

【０００５】

【課題を解決するための手段】本発明は中空繊維内強制通気による、中空繊維束の乾燥方法である。本発明において、内部が液体で濡れた中空繊維の束の、例えば一端から、乾燥用ガスを、好ましくは加熱した乾燥用ガスを、圧力損失の程度に応じて、６００ｍｍH_2Ｏ以下であれば遠心ファンや軸流ファンを用い、これを超えるときは回転ブロワーなどを用い、強制的に中空繊維内部を通過させ、中空繊維内部に含まれる液体を蒸発乾燥させる。

【０００６】本発明において、中空繊維束とは、略一定の長さに切り揃えられた中空状の繊維の束を言い、例えばポリアクリルニトリルやポリスルホンなどの合成高分子や、セルロース系の再生高分子による中空繊維ろ過膜の束が典型的なものであるが、その材質や繊維本数、又は繊維断面の形状、寸法、膜厚、又は繊維束の長さおよび繊維束の形状は特に限定されない。例えば、中空繊維

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の内径は人工腎臓に用いられる約１００μｍのものから限外濾過膜に用いられる０．５～５ｍｍのものまでなどがある。さらに、乾燥用ガスの種類や温度、中空繊維内の通気速度、蒸発させる溶剤の種類なども特に限定されない。前記通気速度は例えば０．５ｍ／秒以上がよい。好ましい範囲は繊維形状などにより異なるが、例えば０．５～１０ｍ／秒である。

【０００７】

【実施例】以下、図示した実施例に基づいて具体的に本発明を説明する。

【０００８】

【実施例１】図１は、中空繊維束の乾燥に本発明を適用した例の概略図である。図１において、乾燥機本体（１）内に設けた通気筒（４）に、液体で濡れた中空繊維束（２）を装着する。この時、封止材（３）を中空繊維束（２）に巻き付け、中空繊維束（２）と通気筒（４）間に隙間を生じない様にする。吸気用遠心ファン（６）によりフィルター（５）を通して吸気した空気（１８）は、ヒーター（７）により所定の温度に加熱し、通気等筒（４）を通して空繊維束（２）の上端部から強制的に中空繊維束内部に供給し、中空繊維を通過して下端部から系外に排気する。（８）は供給空気の温度検出装置であり、（９）はスチーム（１７）の流量制御バルブである。排気された空気は中空繊維束（２）に含まれる水分を蒸発させその潜熱により温度が下がるが、乾燥が完了するにつれ排気される空気（１９）の温度は上昇し、乾燥が完了すると供給空気温度とほぼ同一温度に到達する。（１０）は、この排気温度の検出装置であり、乾燥完了のモニターである。

【０００９】また、通気筒（４）から供給する熱風量が充分に多量で、中空繊維束の端部から排出されてくる空気温度が高い場合には、系外に全てを排気せず排出空気を循環して再加熱し、供給空気として利用する方が方が熱的に有利な事もあり、状況に応じて設計する事ができる。但しこの場合、供給空気を循環利用するため湿度が高まり、中空繊維束の乾燥速度は遅くなる。

【００１０】

【実施例２】図２は図１の方法に、乾燥機本体内部の空気を加熱して循環する事を付加し、乾燥速度を加速する方法である。即ち、図２において（１１）は乾燥機本体内の空気を循環させるための循環ファン、（１２）は循環空気（２０）を加熱するためのヒーター、（１３）は循環空気温度の検出装置、（１４）はスチームの流量制御バルブである。また（１５）、（１６）はそれぞれ循環空気の給、排気ダンパーである。

【００１１】なお、加熱した空気の供給量、温度、湿度は中空繊維の種類、長さ、繊維本数、所要乾燥時間等から必要に応じて合理的に決定する事ができる。

【００１２】

【実施例３、比較例１】ポリスルホン合成高分子を用い

て作成した中空繊維束の水分の乾燥処理を前述の実施例の図１で示した方法で実施した。１００wt％ＤＭＡＣに溶解したポリスルホン原液を水中で紡糸し、内径φ０．７mm、外径φ１．３mmの中空繊維とした。更にこの中空繊維を長さ１．３mに切り揃えて２０２５本集束した後、濃度３０％のグリセリン水溶液中に浸漬し、グリセリン水溶液を充分中空繊維束内に浸透させる。

【００１３】この時中空繊維束に含まれる水の含水率は９８％であった。含水率は、１００×水重量／（ポリスルホン重量＋グリセリン重量）で定義される。図３は、この水とグリセリンを含む中空繊維束から水分を蒸発乾燥させるときにおいて、本発明の方法で乾燥した場合と従来の恒温槽内に単に静置する乾燥方法による場合との、乾燥が完結するまでの中空繊維束内の含水率の経時変化を比較した結果である。

【００１４】すなわち本発明による乾燥処理は、摂氏９０度に加熱した空気を中空繊維束の片側端部から中空繊維束内に０．３m^3／分（単糸内平均通気速度０．８m／秒）供給し、中空繊維束の反対側の端部から出てくる蒸発水分を含んだ空気は系外に排出させて行っている。一方、比較例１の従来の、恒温槽内に静置する乾燥処理は、恒温槽内に多孔板で製作した棚を設置し、その上に中空繊維束を横置きに静置して摂氏９０度に加熱した空気を循環させて行った。この従来の乾燥方法で乾燥を完結させるには４５時間を要するが、本発明による乾燥方法では４時間で乾燥を完結させる事ができる。

【００１５】

＊【発明の効果】本発明の乾燥方法により、短時間で乾燥が可能となり、多量の繊維束の乾燥処理を効率良く行う事ができる。

【図面の簡単な説明】

【図１】本発明による中空繊維束の乾燥方法の例を示した概略図である。

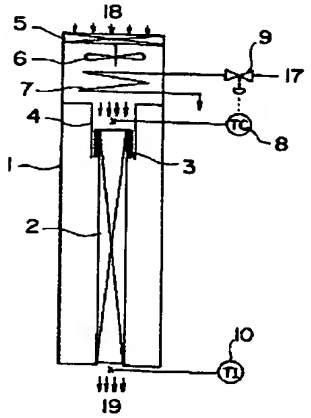
【図２】本発明による中空繊維束の乾燥方法の例を示した概略図である。

【図３】本発明と従来技術の乾燥方法による中空繊維束内の含水率の経時変化を比較した結果である。

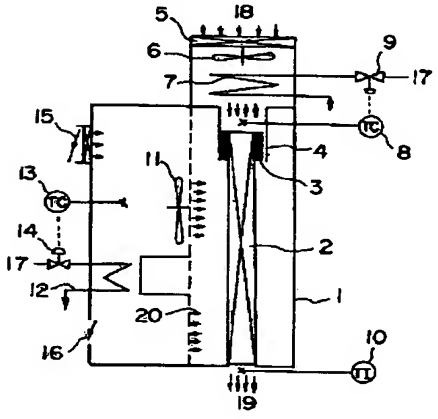
【符号の説明】

１　乾燥機本体
２　中空繊維の束
３　封止材
４　通風筒
５　吸気フイルター
６　吸気ファン
７　ヒーター
８　温度検出装置
９　スチーム流量制御バルブ
１０　排気温度検出装置（乾燥終了モニター）
１１　循環ファン
１２　ヒーター
１３　温度検出装置
１４　スチーム流量制御バルブ
１５　循環空気給気ダンパー
１６　循環空気排気ダンパー

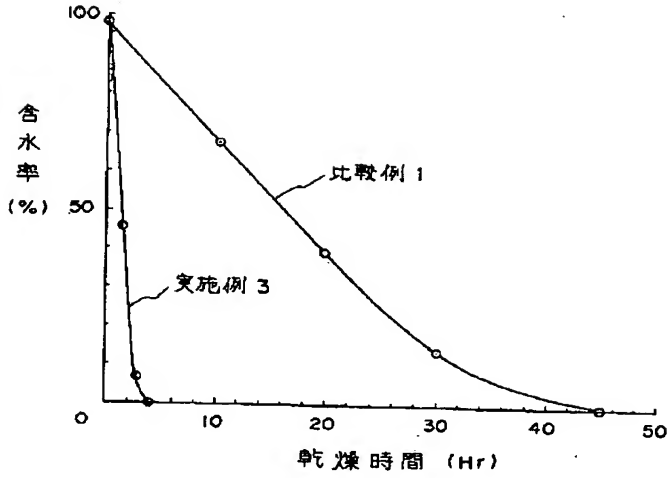
【図１】



【図２】



【図３】



【公報種別】特許法第１７条の２の規定による補正の掲載
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【発行日】平成１１年（１９９９）１１月２日

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【手続補正書】
【提出日】平成１１年１月２７日
【手続補正１】
【補正対象書類名】明細書
【補正対象項目名】特許請求の範囲
【補正方法】変更
【補正内容】
【特許請求の範囲】
【請求項１】　切り揃えられた中空繊維の束の片側端部から、乾燥用ガスを中空繊維内部へ強制的に通気する、中空繊維束の乾燥方法。
【請求項２】　中空繊維束端部へ乾燥用ガスを導く通気筒と、通気筒へ乾燥用ガスを送るファンと、乾燥用ガスの供給温度検出装置および中空繊維束の他端から排気されるガスの温度検出装置とを有する中空繊維束の乾燥装置。
【手続補正２】
【補正対象書類名】明細書
【補正対象項目名】０００１
【補正方法】変更
【補正内容】
【０００１】
【産業上の利用分野】本発明は中空繊維束の製造時などにおける、中空糸内に含む溶剤や、水分を蒸発させる乾燥処理を、短時間で効率よく行う方法、およびそれに用いる乾燥装置に関するものである。
【手続補正３】
【補正対象書類名】明細書
【補正対象項目名】０００４
【補正方法】変更
【補正内容】
【０００４】
【発明が解決しようとする課題】多量に中空繊維を生産する為には、短時間で効率良く中空繊維束から水その他の洗浄溶剤を蒸発させる乾燥方法が工業的に重要である。しかし従来、中空繊維束を短時間で乾燥させる方法または装置が知られていない事から、本発明の目的は中空繊維束を短時間で効率良く乾燥する方法、および装置を提供する事にある。
【手続補正４】
【補正対象書類名】明細書
【補正対象項目名】０００５
【補正方法】変更
【補正内容】
【０００５】
【課題を解決するための手段】本発明は中空繊維内強制通気による、中空繊維束の乾燥方法と装置に関する。すなわちこの発明は、（１）切り揃えられた中空繊維の束の片側端部から、乾燥用ガスを中空繊維内部へ強制的に通気する、中空繊維束の乾燥方法、および（２）中空繊維束端部へ乾燥用ガスを導く通気筒と、通気筒へ乾燥用ガスを送るファンと、乾燥用ガスの供給温度検出装置および中空繊維束の他端から排気されるガスの温度検出装置とを有する中空繊維束の乾燥装置、に関する。本発明において、内部が液体で濡れた中空繊維の束の、例えば一端から、乾燥用ガスを、好ましくは加熱した乾燥用ガスを、圧力損失の程度に応じて、６００mmH_2 O以下であれば遠心ファンや軸流ファンを用い、これを超えるときは回転ブロワーなどを用い、強制的に中空繊維内部を通過させ、中空繊維内部に含まれる液体を蒸発乾燥させる。

【手続補正５】
【補正対象書類名】明細書
【補正対象項目名】０００８
【補正方法】変更
【補正内容】
【０００８】
【実施例１】図１は、中空繊維束の乾燥に本発明を適用した例の概略図である。図１において、乾燥機本体（１）内に設けた通気筒（４）に、液体で濡れた中空繊維束（２）を装着する。この時、封止材（３）を中空繊維束（２）に巻き付け、中空繊維束（２）と通気筒（４）間に隙間を生じない様にする。吸気用遠心ファン（６）によりフィルター（５）を通して吸気した空気（１８）は、ヒーター（７）により所定の温度に加熱し、通気筒（４）を通して中空繊維束（２）の上端部から強制的に中空繊維束内部に供給し、中空繊維を通過して下端部から系外に排気する。（８）は供給空気の温度検出装置であり、（９）はスチーム（１７）の流量制御バルブである。排気された空気は中空繊維束（２）に含まれる水分を蒸発させその潜熱により温度が下がるが、乾燥が完了するにつれ排気される空気（１９）の温度は上昇し、乾燥が完了すると供給空気温度とほぼ同一温度に到達する。（１０）は、この排気温度の検出装置であり、乾燥完了のモニターである。